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22. NEW RECORD OF A PHYTOSEIID MITE, *AMBLYSEIUS FINLANDICUS* OUDM, OCCURRING IN SUGARCANE WITH NOTES ON ITS LIFE HISTORY AND BIONOMICS

(With a photograph)

In India four different species of phytophagous mites have been recorded on sugarcane. Out of these, two are spider mites (Tetranychidae) which commonly damage the crop, and the other two species are the rust mite and the sheath gall mite belonging to the family Eryophyidae. Field observations during 1965 in the Sugarcane Research Station, Bhubaneswar, Orissa, revealed that another species i.e., *Amblyseius finlandicus* Oudm (Phytoseiidae) was associated with sugarcane along with the spider mite *Paratetranychus indicus* Hirst, and caused some injury to the plants.

The occurrence of *Amblyseius finlandicus* on sugarcane has not been reported earlier. Accounts of its biology and taxonomic description are found in the reports of Collyer (1956) and Chant (1957, 1958, 1959). *A. finlandicus* is active in the field throughout the year, and feeds on leaf sap and preys upon the spider mite *P. indicus* as well. The present study was initiated to obtain detailed knowledge of its life history and bionomics on different kinds of food materials, and its possible significance in relation to its role as a predator of pests or pest of sugarcane.

METHODS

The phytoseiid mites were collected from the field by clipping off portions of sugarcane leaf on which they were found in large numbers, and kept in specimen tubes. These were brought to the laboratory and removed to specially designed cages with a fine camel hair brush. The mites were easily visible under a magnifying glass, and no difficulty was experienced in transferring them. Rearing was done in petri dishes of 7.5 cm. inner diameter in which liquid paraffin was poured up to 1/3 cm. depth. After solidification they were filled in with water to about $\frac{1}{2}$ cm. below the rim. Cut pieces (5 cm. long) of fresh sugarcane leaves were kept inside the petri dishes toward the middle below which a thin layer of cotton padding was provided. More water was added to the petri dishes so as to just touch the leaf margin and serve as a barrier for the mites. Different kinds of food such as, honey, the mite (*P. indicus*) and a combination of both were provided on the cut pieces of sugarcane leaves where the phytoseiid was released. This method was found to be convenient for examining the mites under microscope from time to time without disturbing them much.

DESCRIPTION OF LIFE STAGES

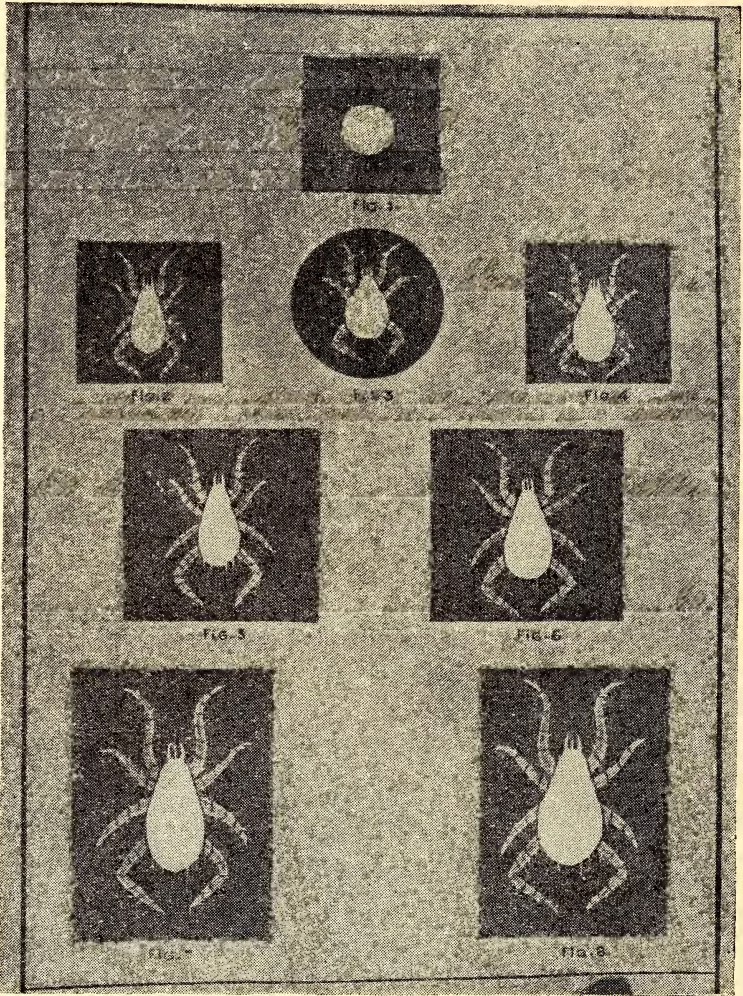
Egg

Freshly laid eggs appeared transparent white and soon changed to light straw colour. They were elliptical in shape, and the average length and breadth measured 0.164 mm. and 0.123 mm. respectively. The egg chorion was quite hard which helped in their easy transfer without causing any damage. The data presented in Table 1 show that the incubation period varied from 36 to 58 hours. The different types of food supplied had very little effect on the speed of embryonic development. In the wet months of July to September the incubation period was slightly prolonged.

Larva

As soon as the larva emerged out of the egg it moved about actively on the leaf surface. Its body was more or less round and pearl white in colour. Average length and breadth measured 0.205 and 0.144 mm. respectively. The first of the three pairs of legs was the longest, and the other two were almost equal in size. Larval development was completed within 38 to 44 hours on the different diets supplied. At this stage the mite did not accept the prey mite

as food, and preferred to feed on the leaf sap rather than the honey droplets provided in the cages. It was interesting to note that the



Different stages of *Amblyseius finlandicus* Oudm.

(Magnified 60 to 70 times the natural size)

FIGS. 1. Egg; 2. Male protonymph; 3. Larva; 4. Female protonymph
5. Male deutonymph; 6. Female deutonymph; 7. Adult male; 8. Adult female;

larval development was faster with sugarcane leaf alone as food. When honey was supplied with the leaf, the larvae required 5 to 6 hours more to complete this stage of development. The prey mites given in the cage were left unharmed by the phytoseiid larva.

TABLE I
EFFECT OF DIFFERENT FOOD MATERIALS ON THE DURATION OF IMMATURE STAGES, ADULT LONGEVITY AND RATE OF REPRODUCTION OF *A. finlandicus* (AVERAGE DURATIONS)

Food	Incubation period (Hours)	Larva (Hours)	Protonymph (Days Hours)	Deutonymph (Days Hours)	Adult longevity (Days)	Number of eggs laid per female
Sugarcane leaf ..	37 to 57	39	6 20	8 12	4 to 6½	3
Sugarcane leaf + Honey ..	36 to 58	44	6 23 6 16 7 05	8 14 8 06 8 16	16 to 19	5
Sugarcane leaf + <i>P. indicus</i> ..	36 to 48	38	6 20 6 23	8 13 8 16	12 to 17	9
Sugarcane leaf + <i>P. indicus</i> + Honey ..	43 to 58	43	6 20 7 05	8 16 8 20	19 to 20	18

Nymph

The larvae became protonymphs after undergoing the first moult. At this stage the nymphs had four pairs of legs and the sexes were easily distinguishable. The female was broader than the male with a swollen body. The male appeared flat and narrow and developed more quickly. Different food did not significantly influence the protonymphal duration, and the mites moulted for the second time after about 7 days to become the deutonymphs. These deutonymphs continued feeding and developing on the leaf sap and honey without showing any predaceous habit. No marked difference in the rate of deutonymphal development was apparent with the change of food in different cages, and the nymphs became adults after 8 to 9 days with the different food substances provided. Average body measurements of this stage are given below.

Stage	Sex	Length (mm.)	Breadth (mm.)
Protonymph	♂	0.246	0.153
	♀	0.267	0.064
Deutonymph	♂	0.288	0.174
	♀	0.308	0.185

Adult

The body colour of *A. finlandicus* did not change at any stage of the life history. However, females preying on *P. indicus* appeared brown. The body measurements were, male—0.328 × 0.200 mm. and female—0.349 × 0.236 mm. The adult mites displayed varied food habits. They fed on the leaf sap, honey and also preyed upon the Tetranychid in the rearing cages. The effect of different food on the rate of reproduction and adult longevity was distinctly evident. As shown in Table 1, individuals fed with honey or the prey mites or a combination of both lived much longer than those fed on sugarcane leaf. With the spider mite in the diet the phytoseiid adults lived for 12 to 17 days; and adding honey to the food increased the longevity by 3 to 4 days. Honey was found to provide the required nutrition and prolonged the laying and post-laying periods of the female imago.

The egg-laying capacity of this species was found to be poor. A single fertilized female nourished on sugarcane leaf or honey did not lay more than 5 eggs during its life time. However, when both the prey mite and honey were made available, each female laid more than three times the number of eggs than what was laid with sugarcane leaf plus honey as food. In cages where *P. indicus* mites were provided along with sugarcane leaf, the phytoseiid readily preyed upon the former, and the reproductive rate was decreased by one half than

TABLE 2
 FLUCTUATIONS IN FIELD POPULATIONS OF *A. finlandicus* AND *P. indicus* IN SUGARCANE VARIETIES

Sugarcane variety	Mean number of mites per 10 leaves											
	August		September		December		January		April		May	
	A.f.	P.i.	A.f.	P.i.	A.f.	P.i.	A.f.	P.i.	A.f.	P.i.	A.f.	P.i.
Co. 6403	10.8	3.1	11.3	2.7	8.5	2.2	18.0	2.4	9.2	55.5	12.5	50.1
Co. 6407	8.6	1.8	10.3	1.3	11.8	2.6	11.0	1.8	7.5	70.8	8.5	49.2
Co. 62022	14.4	4.5	13.0	2.7	15.0	3.8	16.2	1.4	9.5	65.5	11.5	52.5
Mean Temp. °C. ..	28.9		28.5		20.6		20.7		30.5		32.7	
R.H. % ..	86		82		64		72		62		63	

A.f.:—*A. finlandicus*

P.i.:—*P. indicus*

what was seen with a combination of all three food substances. Thus it was evident that inclusion of the prey mite and honey had some stimulating effect which increased adult longevity and rate of reproduction of the Phytoseiid mite.

Mating behaviour:

As soon as the female completed the nymphal development, mating took place. Often more than one male attempted to mate with a female and finally one quickly climbed over the female. Soon after it slipped underneath the female body and mated by attaching itself to the ventral side of its partner. The process of mating continued for 25 to 30 seconds after which they separated. Both males and females mated several times.

Egg-laying started 1 to 2 days after mating, and more than 90% of the eggs deposited by fertilized females hatched into larvae. Out of 30 larvae kept under observation, 11 developed as males and 19 as females.

FIELD OBSERVATIONS

A. finlandicus was active in the field throughout the year. The fluctuations in the population levels of this species and its prey *P. indicus* were carefully observed on 3 sugarcane varieties during the wet, cold, and summer months.

From the data presented in Table 3 no definite predator-prey relationship between the phytoseiid and the tetranychid was evident. During the summer months the prey species was most numerous in the field with a mean number varying between 50.1 and 70.8 mites per 10 sugarcane leaves examined at random. On the other hand, the number of *A. finlandicus* for the same unit sample did not exceed 12.5. In the other two seasons the situation was somewhat reversed. December and January provided most favourable conditions for the phytoseiid with temperature varying between 20.6° and 20.7°C, and R.H. 64 and 72%. Co 6403 and Co 62022 cane varieties recorded as high as 18 and 16.2 mites per 10 leaves respectively even though the number of *P. indicus* varied between 1.4 and 3.8 per 10 leaves. However, in August and September some kind of balance in population densities of the predatory phytoseiid and its tetranychid prey species was apparent. High atmospheric temperature of 30.5 to 32.7°C and R.H. 62 to 63% appeared detrimental for the rapid multiplication of *A.*

finlandicus although, such environmental conditions were found to be most favourable for the spider mite *P. indicus*.

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23. *PHYLLANTHUS MUKERJEEANUS* MITRA & BENNET—
NEW RECORD FOR ORISSA STATE

This species was described in the year 1967 (*Bull. Bot. Soc. Bengal* **19**:145) from a collection made from Howrah District, W. Bengal on 3-iv-1964. Since then it has not been recorded from any other place. Recently a collection of this species by V. Abraham (No. 327, dated 20-iv-1965) from Puri, was found in Botanical Survey of India Herbarium. *P. mukerjeeanus* is closely allied to *P. debilis* Willd.; but distinguished mainly by the presence of leaves on main stem and primary branches, the seeds are hairy with 8-10 longitudinal ribs, whereas in *P. debilis* the main stem and primary branches are without leaves, and the seeds smooth with 6-7 longitudinal ribs on the back.

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24. *CANSCORA CONCANENSIS* C. B. CL. IN MAHARASHTRA
(With a plate)

Canscora concanensis C. Clarke, which is apparently endemic in western India, was originally described by C. B. Clarke (1883) based on a single specimen, collected by Law sometime during 1840-50 from Concan, without precise locality. Cooke (1905) also cited the same